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Beyond the Screen: Linking Problematic Smartphone Use With Anxiety, Depression, and Sleep Disturbances Among College Students

Sharma SS[1], Rahul Gandheer[2]
[1]Associate Professor, department of Psychiatry, MES Medical College, Kerala.
[2]Professor, department of General Medicine, MES Medical College, Kerala.

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Corresponding Author: Dr Rahul Gandheer
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Abstract

Background: Problematic smartphone use (PSU) is increasingly recognized among college students and may coexist with psychological distress and disturbed sleep. This study evaluated the prevalence of PSU and its association with depression, anxiety, and sleep quality among college students.

Methods: A prospective observational study was conducted at MES Medical College, Kerala, from May 2025 to April 2026 among 126 students. PSU was assessed using the Smartphone Addiction Scale–Short Version, depression with PHQ-9, anxiety with GAD-7, and sleep quality with the Pittsburgh Sleep Quality Index. Associations were examined using appropriate comparative tests and odds ratios.

Results: PSU was identified in 48 (38.1%) students. Its prevalence increased significantly with longer daily smartphone use and was higher among students reporting nighttime use. Depression was more frequent among students with PSU than among those without PSU (50.0% vs 21.8%; OR=3.59), as was anxiety (45.8% vs 17.9%; OR=3.87). Poor sleep quality occurred in 70.8% of the PSU group compared with 37.2% of the non-PSU group (OR=4.10). Mean PHQ-9, GAD-7, and PSQI scores were significantly higher among students with PSU.

Conclusion: PSU was common and was significantly associated with depression, anxiety, and poor sleep quality, supporting integrated digital-behaviour, mental-health, and sleep interventions for college students.

Keywords: Anxiety; College students; Depression; Problematic smartphone use; Sleep quality.

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Introduction

Smartphones have become integral to academic, social, and recreational activities among college students; however, excessive and poorly controlled use may develop into problematic smartphone use (PSU), characterized by persistent use despite adverse effects on daily functioning. Emerging evidence indicates that greater smartphone addiction or PSU is associated with higher levels of depression, anxiety, stress, and impaired sleep quality among university students [1]. Longitudinal evidence further suggests that PSU may adversely influence sleep both directly and indirectly through anxiety and depressive symptoms, highlighting the close interaction between digital behaviour, psychological distress, and sleep [2]. Similar associations between smartphone addiction, poor sleep quality, depression, anxiety, and stress have been demonstrated among medical students [3]. College students may be particularly vulnerable because of academic demands, unrestricted internet access, and frequent nighttime smartphone use. Therefore, the present study aimed to assess problematic smartphone use among college students and determine its association with anxiety, depression, and sleep quality.

Methods:

This prospective observational study was conducted at MES Medical College, Kerala, from May 2025 to April 2026 among undergraduate college students. A total of 126 students aged 18 years or older were recruited using a consecutive sampling method after obtaining approval from the Institutional Ethics Committee. Students enrolled in undergraduate courses during the study period who possessed and regularly used a smartphone for at least six months and were willing to provide written informed consent were included. Students who were seriously ill at the time of assessment, were unable to understand or complete the study questionnaires, or submitted substantially incomplete responses were excluded. Demographic and smartphone-use information was collected using a structured proforma that recorded age, sex, year of study, place of residence, average daily smartphone-use duration, predominant purpose of smartphone use, nighttime smartphone use, and self-reported duration of sleep. Problematic smartphone use was assessed using the Smartphone Addiction Scale–Short Version (SAS-SV), a 10-item self-administered instrument in which higher scores indicated greater severity of problematic smartphone use. Participants were categorized according to the recommended SAS-SV thresholds, and the total score was also retained as a continuous variable for association and correlation analyses.

Psychological and sleep-related outcomes were assessed using standardized validated

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questionnaires administered under uniform conditions. Depressive symptoms were assessed with the 9-item Patient Health Questionnaire (PHQ-9), with total scores ranging from 0 to 27 and increasing scores representing greater depressive symptom severity. Anxiety symptoms were evaluated using the 7-item Generalized Anxiety Disorder scale (GAD-7), which generated scores ranging from 0 to 21 and permitted classification of anxiety severity. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), which evaluated subjective sleep quality, latency, duration, efficiency, disturbances, use of sleep medication, and daytime dysfunction during the preceding month; a global PSQI score greater than 5 was considered indicative of poor sleep quality. Questionnaires were completed anonymously to minimize social desirability bias, and confidentiality of individual responses was maintained throughout the study. Data were entered into a computerized database and analyzed using appropriate statistical software. Continuous variables were expressed as mean with standard deviation or median with interquartile range, while categorical variables were summarized as frequencies and percentages. Associations between problematic smartphone use and depression, anxiety, and poor sleep quality were examined using the chi-square test, independent-samples *t* test, and correlation analysis as appropriate. Multivariable logistic regression was performed to identify independent associations after adjustment for relevant demographic and smartphone-use characteristics. A two-sided P value <0.05 was considered statistically significant.

Results:

A total of 126 college students were included in the analysis, with a mean age of 20.3 ± 1.6 years; 64 (50.8%) were female and 62 (49.2%) were male. Problematic smartphone use (PSU), based on the SAS-SV criteria, was identified in 48 (38.1%) participants. PSU did not differ significantly according to sex (P=0.552), whereas its prevalence increased significantly with increasing daily smartphone-use duration (χ^2=13.10, P=0.001). Students reporting nighttime smartphone use also had a significantly higher prevalence of PSU than those without nighttime use (47.6% vs 20.5%; χ^2=8.92, P=0.003) (Table 1). Depression was present in 41 (32.5%), anxiety in 36 (28.6%), and poor sleep quality in 63 (50.0%) students. Depression was significantly more frequent among students with PSU than among those without PSU (50.0% vs 21.8%; OR=3.59, 95% CI: 1.64–7.83; P=0.001). Similarly, anxiety was more frequent in the PSU group (45.8% vs 17.9%; OR=3.87, 95% CI: 1.72–8.70; P<0.001). Poor sleep quality was observed in 70.8% of students with PSU compared with 37.2% without PSU (OR=4.10, 95% CI: 1.89–8.89; P<0.001). Mean PHQ-9, GAD-7, and PSQI scores were also significantly higher among students with PSU (Table 2).

Discussion:

The present study identified PSU in 38.1% of 126 college students, indicating that maladaptive smartphone behaviour affected a substantial proportion of this young population. Reported prevalence varies widely across university populations because of differences in study setting, measurement tools, definitions, and cut-offs. Gunasekar et al. reported smartphone addiction in 47.8% of medical students, while Alhafi et al. documented a high burden of smartphone addiction together with sleep disturbance; a recent systematic review among nursing students also demonstrated considerable heterogeneity [4 – 6]. In the present study, PSU increased from 17.9% among students using smartphones for less than four hours daily to 57.5% among those using them for more than six hours. Nighttime smartphone use was also significantly associated with PSU. Repeated checking, social-media engagement, gaming, messaging, and unrestricted nighttime access may reinforce habitual use and weaken self-regulation. Nikolic et al. similarly identified prolonged smartphone use as an important correlate of smartphone addiction among medical students [3]. These observations suggest that duration and timing of smartphone use may be particularly useful when identifying students at risk and when designing targeted behavioural interventions within college health services, particularly for students reporting persistent nighttime use, academic interference, or impaired daily functioning.

A major finding was the strong association between PSU and psychological morbidity. Depression was present in 50.0% of students with PSU compared with 21.8% without PSU (OR=3.59), while anxiety affected 45.8% and 17.9%, respectively (OR=3.87). Mean PHQ-9 and GAD-7 scores were also significantly higher in the PSU group. These findings agree with the meta-analysis by Augner et al., which demonstrated significant associations between PSU and symptoms of anxiety and depression [7]. Tang et al. also reported an association between PSU and depressive symptoms among university students [8]. More recent work has explored possible mechanisms. Elkin demonstrated that depression, anxiety, and stress partly mediated the relationship between smartphone addiction and sleep quality [1], while Herrell and Foster found that problematic phone use was related to depressive and anxiety symptoms in graduate students, with sleep quality contributing to these relationships [9]. Possible explanations include social comparison, fear of missing out, academic distraction, reduced offline interaction, and using smartphones as an avoidant coping strategy. Reverse direction is also possible, because students with pre-existing anxiety

or depressive symptoms may increasingly use smartphones for reassurance, distraction, social contact, or emotion regulation.

The relationship between PSU and sleep was particularly marked. Poor sleep quality occurred in 70.8% of students with PSU compared with 37.2% without PSU, giving approximately four-fold higher odds of poor sleep. This closely resembles the findings of Alhafi et al., who reported a significant association between smartphone addiction and poor sleep among medical students [4]. Zhu et al. likewise demonstrated an adverse relationship between smartphone addiction and sleep quality among college students and highlighted a potential modifying role of physical exercise [10]. Longitudinal evidence strengthens the plausibility of this association. Wu et al. showed that PSU predicted poorer sleep quality over time and that anxiety and depression contributed as mediating pathways [2]. Cemei et al. reported reciprocal longitudinal relationships linking PSU with bedtime procrastination, sleep quality, and mental-health symptoms among university students [11]. Ahmed et al., in a systematic review and meta-analysis, similarly supported an interrelationship between problematic social-media use, mental health, and sleep [12]. Smartphone use near bedtime may delay intended sleep, increase cognitive arousal, prolong engagement with stimulating content, and expose users to notifications that fragment sleep. Screen light may additionally delay circadian preparation for sleep. The simultaneous elevation of PHQ-9, GAD-7, and PSQI scores therefore suggests an interconnected behavioural and psychological pathway.

These findings have practical implications for student mental-health programmes. Screening for PSU may offer an opportunity to identify students who also warrant assessment for depression, anxiety, and sleep disturbance. Interventions should not pathologize ordinary smartphone use but should focus on loss of control, functional impairment, nighttime use, and sustained excessive exposure. Useful strategies may include digital-wellbeing education, limiting non-essential notifications, smartphone-free periods before bedtime, regular physical activity, greater face-to-face interaction, and psychological support for students with clinically relevant symptoms. Evidence that psychological distress can mediate the smartphone–sleep relationship suggests that reducing screen exposure alone may be insufficient when excessive use functions as a coping response [1, 2]. Recent evidence also links problematic smartphone use among healthcare and nursing students with broader psychosocial and academic consequences [5, 6]. Several limitations should be considered. The single-centre setting and modest sample size may restrict generalizability. Smartphone exposure and the psychological outcomes were primarily self-reported, creating potential recall and reporting bias; objective usage logs and actigraphy were not used. Although recruitment was prospective, exposure and outcomes were assessed within the same observational framework, so causality cannot be established. Larger multicentre longitudinal studies incorporating objective digital-use measures are needed to clarify directionality, identify modifiable mediators, and determine whether reducing PSU improves mental health and sleep.

Conclusion: Problematic smartphone use was common among college students and showed significant associations with depression, anxiety, and poor sleep quality. Students with PSU had substantially greater psychological symptom burden and approximately four-fold higher odds of poor sleep, while longer daily use and nighttime smartphone use were important behavioural correlates. These findings support incorporating assessment of digital-use patterns into college mental-health programmes. Interventions should combine responsible smartphone-use strategies with sleep-hygiene education and screening for anxiety and depressive symptoms. Multicentre longitudinal studies using objective smartphone-use and sleep measures are required to establish temporal relationships and evaluate whether targeted digital-behaviour interventions improve student well-being.

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Table 1: Participant characteristics and distribution of problematic smartphone use; n (%)

Characteristic	Total	PSU	Non-PSU	Statistic	P value
Overall	126 (100)	48 (38.1)	78 (61.9)	—	—
Gender					
Male	62 (49.2)	22 (35.5)	40 (64.5)	χ^2=0.35	0.552
Female	64 (50.8)	26 (40.6)	38 (59.4)		
Daily smartphone use					
<4 hours/day	39 (31.0)	7 (17.9)	32 (82.1)	χ^2=13.10	**0.001**
4–6 hours/day	47 (37.3)	18 (38.3)	29 (61.7)		
>6 hours/day	40 (31.7)	23 (57.5)	17 (42.5)		
Night time smartphone use					
Yes	82 (65.1)	39 (47.6)	43 (52.4)	χ^2=8.92	**0.003**
No	44 (34.9)	9 (20.5)	35 (79.5)		

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Table 2: Association of problematic smartphone use with depression, anxiety, and sleep quality

Outcome	PSU	Non-PSU	Statistic / OR (95% CI)	P value
Depression, n (%)	24 (50.0)	17 (21.8)	OR 3.59 (1.64–7.83)	0.001
Anxiety, n (%)	22 (45.8)	14 (17.9)	OR 3.87 (1.72–8.70)	<0.001
Poor sleep quality, n (%)	34 (70.8)	29 (37.2)	OR 4.10 (1.89–8.89)	<0.001
PHQ-9 score, mean ± SD	10.1 ± 5.4	6.4 ± 4.6	t=3.95	<0.001
GAD-7 score, mean ± SD	9.0 ± 4.8	5.6 ± 4.3	t=4.02	<0.001
PSQI score, mean ± SD	7.5 ± 3.1	5.4 ± 2.6	t=3.92	<0.001

PHQ-9: Patient Health Questionnaire-9; GAD-7: Generalized Anxiety Disorder-7; PSQI: Pittsburgh Sleep Quality Index; OR: odds ratio; CI: confidence interval; SD: standard deviation.